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DESIGN REPORT UPON  
WASTE WATER TREATMENT  
for the  
VILLAGE OF MONSANTO, ILLINOIS  
September 21, 1962

Metcalf & Eddy  
Engineers  
Boston, Massachusetts

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## REPORT

Design Report upon Waste Water Treatment  
for the Village of Monsanto, Illinois

GENERAL

The Village of Monsanto, Illinois is an industrial complex located south of East St. Louis on the Mississippi River.

All of the wastes from the Village are presently discharged to the Mississippi River through the Village sewerage system.

The sources of waste water include: an organic chemical producer, an oil refinery, a zinc plant, an integrated copper mill, a rubber reclaiming plant, a fertilizer plant, a steel foundry, and a small number of dwellings.

In compliance with the pollution control program initiated on the Mississippi River, the Village of Monsanto, Illinois has engaged Metcalf & Eddy to prepare detailed designs, including plans and specifications, for the construction of a primary waste treatment plant and relief interceptors.

PREVIOUS REPORTS

An initial Study of Pollution Abatement for the East Side Levee and Sanitary District, of which the Village of Monsanto is a part, was carried out by Horner and Shifrin, Consulting Engineers, St. Louis, Missouri, during

1959. Horner and Shifrin concluded that the wastes from Monsanto Village would probably require treatment by the activated sludge process.

Following this initial study, a report titled, "Report Upon Waste Water Treatment for the Village of Monsanto, Illinois," dated November 3, 1960, was prepared by Metcalf & Eddy. This report recommended the separation of Village waste waters with subsequent primary treatment, consisting of sedimentation for metal-bearing wastes and secondary treatment by the activated sludge process for phenol-bearing wastes. Pertinent design data and cost estimates were included in this report.

Following the completion of this report, studies of in-plant modifications were initiated by the various industries which indicated that significant reductions of the volume of waste water, and organic, metallic, phenolic, and acid contaminants could be accomplished but at considerable cost.

In order to determine whether further studies of in-plant modifications were economically justified, financial studies were made; and a second report titled, "Costs for Waste Water Treatment for the Village of Monsanto, Illinois," dated March 16, 1962, was prepared by Metcalf & Eddy.



Actual and proposed reductions by the industries in the volume of contaminants has since resulted in a major revision of concept from that outlined in the previous reports.

In the year 1959, the average load of phenols discharged to the river per day by the Village of Monsanto was 13,000 pounds. In April 1962, this had been reduced to 4,000 pounds as a result of in-plant modifications by the industries. Further modifications are planned to reduce to a level of 1,000 lb. per day.

An agreement has been tentatively reached between the Illinois State Water Board and the Village of Monsanto that, if a limit of 1,000 pounds per day of phenols is attained, primary treatment will suffice. However, if the 1,000 pounds per day proves excessive in the river, further in-plant reductions will be necessary or secondary treatment must be provided in the future.

Important reductions in C.O.D. (Chemical Oxygen Demand) have also been accomplished through in-plant modifications since 1959. During that year, the Village was discharging approximately 223,000 pounds of C.O.D. per day to the river. During March and April of 1962, this amount had been reduced to 96,000 pounds per day. A further reduction to 50,000 pounds per day is anticipated by the end of 1962.

Since the discharge of phenolic wastes and C.O.D. will be reduced by the industries to a level permissible for discharge to the Mississippi River, the immediate need for secondary treatment has been eliminated; and primary treatment facilities should provide adequate treatment for the Monsanto Village wastes.

#### WASTE TREATMENT PLAN

The objectives of the primary waste treatment plant will be as follows:

1. To remove all floatable material.
2. To remove most of the settleable solids.
3. To remove the settleable toxic metals.

#### SCOPE OF PROJECT

The scope of the presently proposed project includes the construction of approximately 8,500 feet of relief intercepting sewer as shown in Figure 1 and a primary waste treatment plant as shown in Figure 2. Costs of the proposed project are shown in Tables 1 and 2. Basic design data is shown on page 11.

The proposed relief interceptor will convey wastes, which are presently discharged without treatment to the Mississippi River to the proposed waste treatment plant.

The proposed waste treatment plant will include renovation of the existing stormwater pumping station to a wastes pumping station, construction of primary settling lagoons, sludge neutralization and elutriation facilities, sludge disposal lagoons, and oil and scum storage tanks.

Provisions for the future installation of neutralization and secondary treatment facilities, if found necessary, will be incorporated in the design.

## DESCRIPTION OF PROPOSED WASTE TREATMENT FACILITIES

### Renovation of Existing Pumping Station

The existing stormwater pumping station will be renovated and utilized both to pump waste water to the waste treatment plant and to pump combined wastes and stormwater to the river during high river stages until the completion of a new stormwater pumping station to be constructed by the Corps of Engineers. At that time, the existing station will be used only to pump waste water to the treatment plant. The proposed C. of E. pumping station will be used to pump the waste treatment plant effluent and stormwater to the river at high river stages.

Increased acid resistance will be provided for the existing pumping station as well as structural improvement and repair. The three more recently installed existing pumps will be utilized for waste water pumps under normal operating conditions. Epoxy coatings will be used for protection of the concrete surfaces.

### Flow Measurement

Measurement of flow to the waste treatment plant will be accomplished by a Parshall flume. In addition, Parshall flumes will be provided for monitoring the individual waste flows from the various industries.

### Settling Lagoons

The settling lagoons will be of earth construction with one vertical to two and one-half horizontal side slopes. The slopes will have an asphalt surface coating, and the bottom will have a concrete lining. The liquid depth of the lagoons will be about 10 ft. "Cable type" sludge collecting equipment will be provided in the settling lagoons for sludge collection and scum skimming. The equipment will be supported on treated wooden piles and beams. Except for the sludge scrapers, all the moving parts of this equipment will be elevated above the water surface which will allow them to be relatively free of corrosion.

The lagoons will be designed for parallel operation so that the combined volume of both lagoons will provide two hours detention at a design flow of 40 mgd. (million gallons per day).

Sludge sumps for sludge concentration and withdrawal will be provided in the bottom of the settling lagoons. Sludge pumps and controls will be housed in the basement of the Main Building.

Oil and scum will be removed in the settling lagoons and will be stored in a circular corrosion-resistant tank for disposal by contract burning or burying.

### Sludge Conditioning

Sludge neutralization and elutriation will be provided prior to the lagooning of the sludge to prevent contamination of the ground water in the area.

Sludge neutralization will be accomplished in tanks equipped with flash mixers and lime slurry feed.

Two circular tanks of 30-ft. diameter with rake arms and pickets will be provided for elutriation of the sludge.

### Sludge Lagoons

Sludge production at the waste treatment plant has been estimated to amount to approximately 50,000 gpd. of compacted sludge. The design of the sludge lagoons will provide alternate annual operation of two sludge lagoons and a sludge depth of 3 ft. Two 20-acre lagoons will be constructed which will provide more than enough volume for sludge storage.

### Main Building

The Main Building will house the office, laboratory, flow measurement indicators, and toilet and locker facilities.

The building will be of concrete block construction with brick facing.

### Maintenance Building

The Maintenance Building will house trucks and special equipment necessary for the maintenance and operation of the waste treatment plant.

The building will be an industrial-type building of economical construction.

#### Relief Interceptors

The proposed relief interceptors will be constructed of epoxy-lined reinforced concrete or vitrified clay pipe with suitable acid-resistant joints.

#### BASIS OF COST ESTIMATES

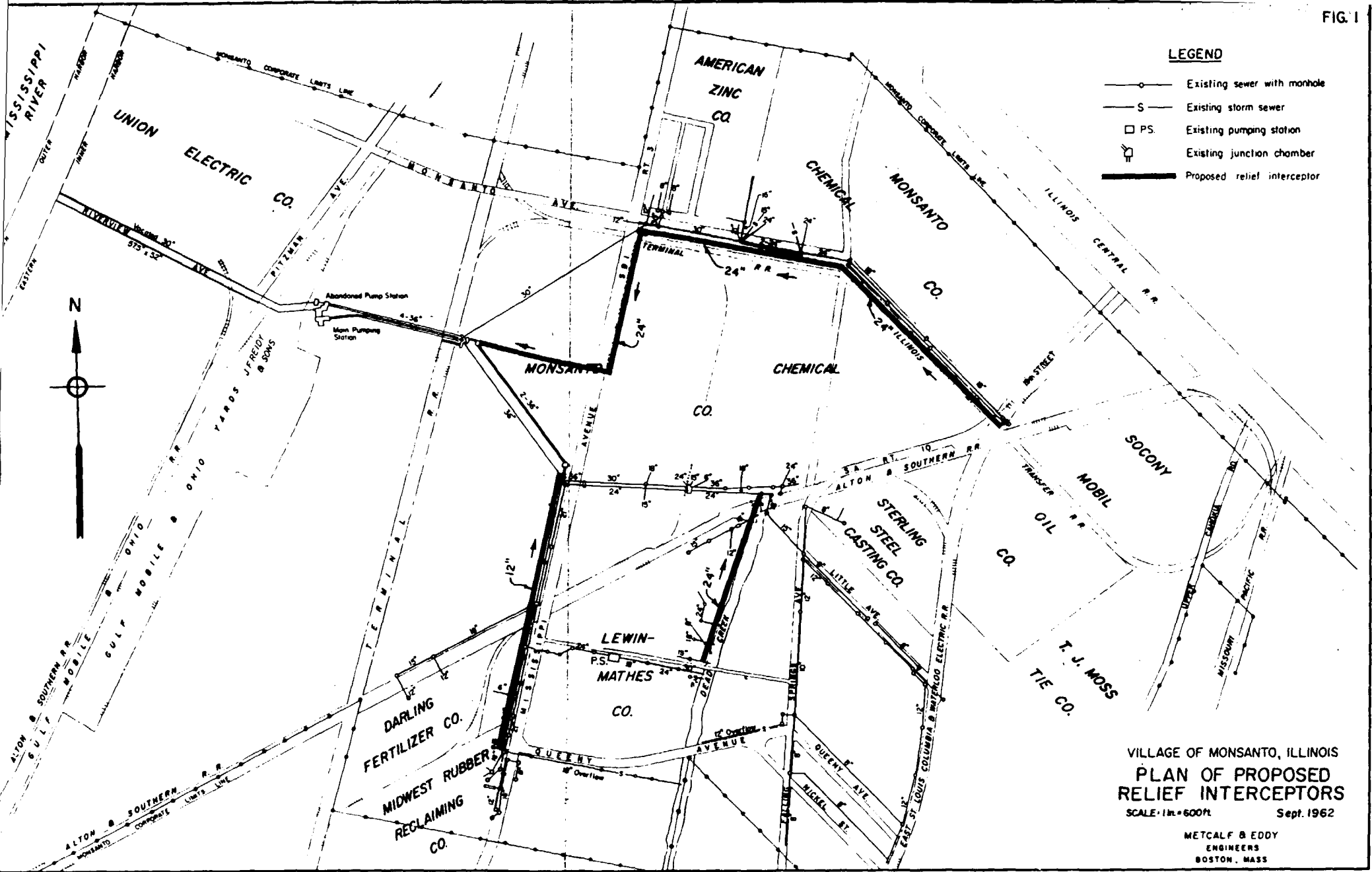
##### Cost Level and Allowances

The cost estimates used in this report are based upon cost levels corresponding to an ENR Construction Cost Index of 1050.

Estimated construction costs include allowances for contractor's overhead and profit.

Total capital costs include allowances for construction contingencies, equipment, borings, surveys, materials, testing and all administrative, legal, fiscal, and engineering costs.

Annual costs include estimated salaries; estimated administrative costs, including allowances for Workmen's Compensation, Social Security, a pension fund and a hospital service plan; estimated comprehensive, public liability, property damage and fire insurance costs; allowances for bond indenture consulting services, general plant maintenance, and equipment renewal; and estimated power and chemical costs.



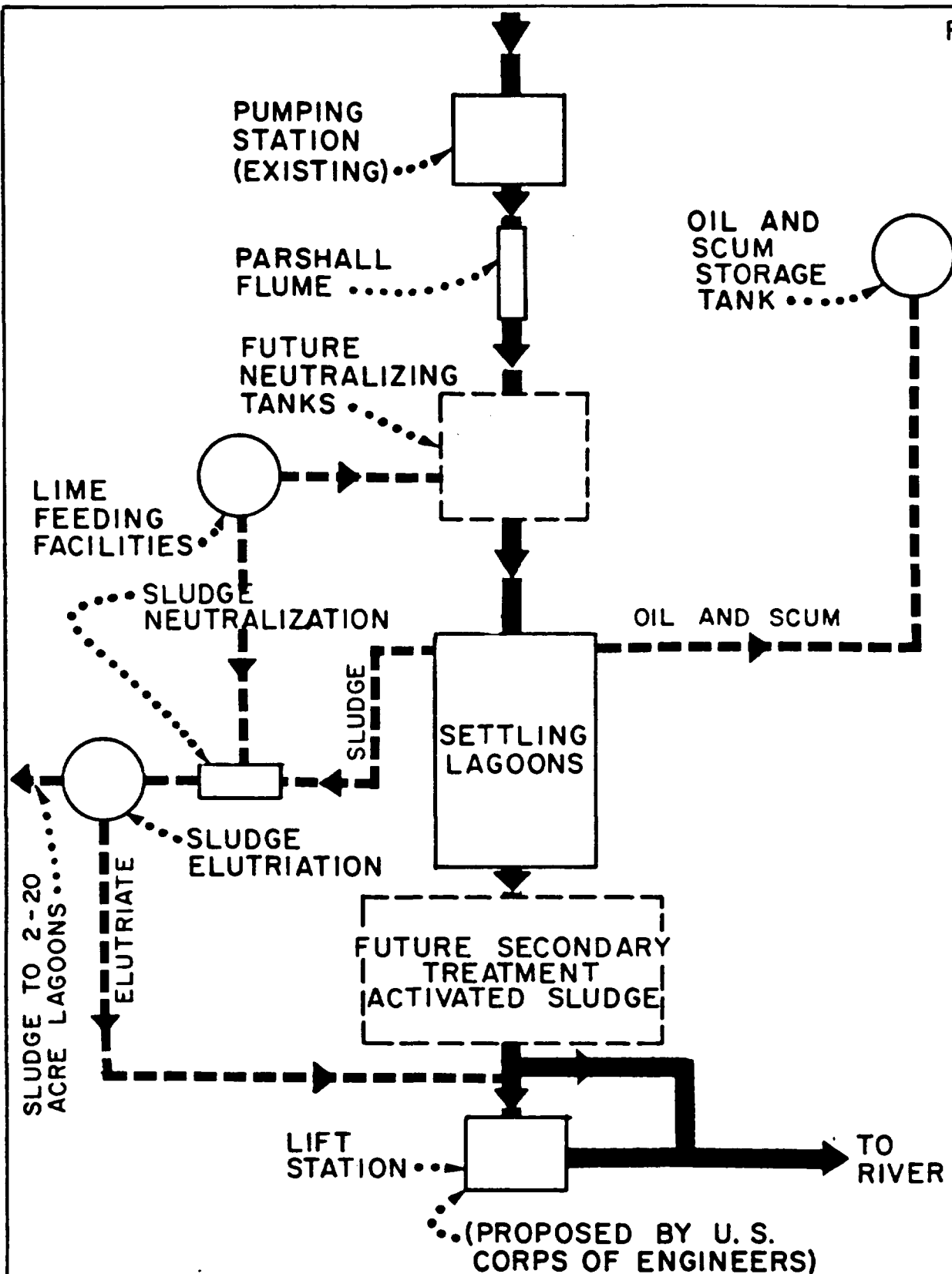
LEGEND

- Existing sewer with manhole
- Existing storm sewer
- PS. Existing pumping station
- Existing junction chamber
- Proposed relief interceptor

VILLAGE OF MONSANTO, ILLINOIS  
PLAN OF PROPOSED  
RELIEF INTERCEPTORS  
SCALE: 1 in. = 600 ft. Sept. 1962

METCALF & EDDY  
ENGINEERS  
BOSTON, MASS.

FIG. 2



VILLAGE OF MONSANTO, ILLINOIS

FLOW DIAGRAM  
PROPOSED PLANT FOR  
WASTES TREATMENT

SCALE: NONE SEPT, 1962  
METCALF & EDDY  
ENGINEERS  
BOSTON, MASS



## BASIC DESIGN DATA

1.	Design Flow, mgd.	40
2.	Main Pumping Units (Existing Pumps)	
	Number of units	6*
	Capacity of each unit, gpm.	10,000
3.	Waste Flow Measurement	4 ft. Parshall Flume
4.	Primary Settling Lagoons	
	Number of Units	2
	Total volume, cu. ft.	442,000
	Total area, acres	1
	Overflow rate, gal./s.f./day	900
	Total detention time, hrs.	2
5.	Lime Feeding Facilities	
	Type of feed	slurry
	Acidity to be neutralized ( $\text{CaCO}_3$ ) lbs./day	172
6.	Sludge Neutralization Tanks	
	Number of units	2
	Detention time, minutes	15
7.	Sludge Elutriation Tanks	
	Number of units	2
	Inside diameter, ft.	30
	Side wall liquid depth, ft.	7
	Unit volume, cu. ft.	4,000
	Detention time, hr.	7.2
8.	Sludge Disposal Lagoons	
	Number of units	2
	Unit size, acres	20

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\*3 units to be utilized during normal flow conditions

Table 1  
Estimated Construction and Capital Costs  
for Relief Interceptors

Item	Estimated Capital Cost
2,000 l.f. 12-in. sewer Mississippi Avenue	\$ 82,000
5,000 l.f. 24-in. sewer Mississippi Avenue, Monsanto Avenue, and Monsanto Avenue extension	323,000
1,300 l.f. 24-in. sewer adjacent to Dead Creek	68,000
Inverted siphon - Mississippi Avenue	30,000
250 l.f. Relocation 24-in. sewer Mississippi Avenue	<u>12,000</u>
Total Estimated Construction Cost	515,000
Contingency and Engineering	105,000
Financing, Legal, and Administrative Costs	<u>21,000</u>
Total Estimated Capital Costs	\$641,000

**Table 2**  
**Estimated Construction and Capital Costs**  
**For Waste Treatment Plant**

Item	Estimated Capital Cost
Pumping Station Improvements	\$ 70,000
Flow Measurement in Plant	25,000
Flow Measurement of Industries	45,000
Oil and Scum Storage Tank	10,000
Settling Lagoons	370,000
Lime Feeding Facilities	10,000
Clean Water Supply & Distribution	20,000
Sludge Pumping Facilities	45,000
Sludge Neutralization	10,000
Sludge Elutriation	40,000
Sludge Lagoons	125,000
Outside Piping and Yard Work	205,000
Maintenance Building	60,000
Main Building	<u>110,000</u>
Total Estimated Construction Costs	1,145,000
Contingencies and Engineering	230,000
Purchase of Special Equipment	60,000
Financing, Legal and Administrative Costs	<u>45,000</u>
Total Estimated Capital Costs	<u>\$1,480,000</u>

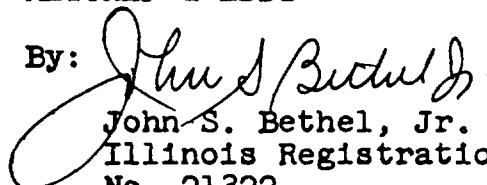
## ACKNOWLEDGMENT

We wish to express our appreciation to Mayor Leo Sauget, the Village Board, Mr. Joseph W. Goldenburg, Village Engineer, and representatives of the various industries for their cooperation and assistance in the preparation of this report.

Respectfully submitted,

METCALF & EDDY

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